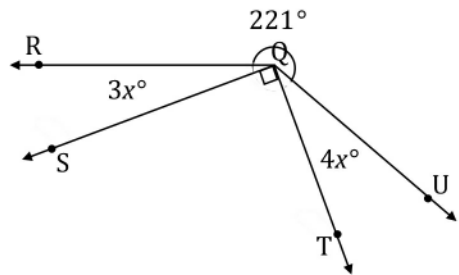Name _____ Date_____

Angle Problems and Solving Equations

Write an equation for the angle relationship shown in the figure and solve for x. Find the measures of $\angle RQS$ and $\angle TQU$.
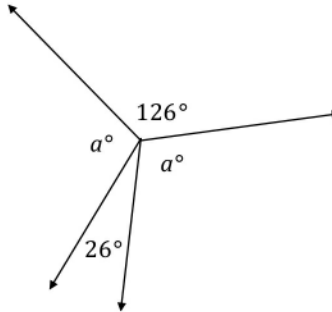
In a complete sentence, describe the angle relationships in each diagram. Write an equation for the angle relationship(s) shown in the figure, and solve for the indicated unknown angle. You can check your answers by measuring each angle with a protractor.
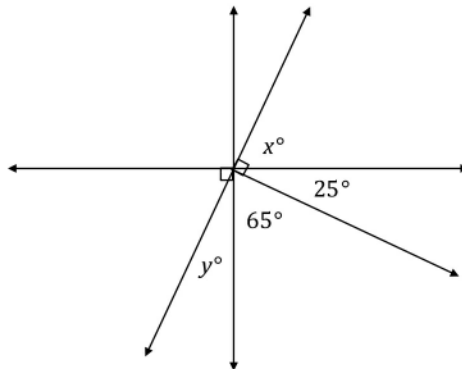
1. Find the measures of $\angle EAF$, $\angle DAE$, and $\angle CAD$.
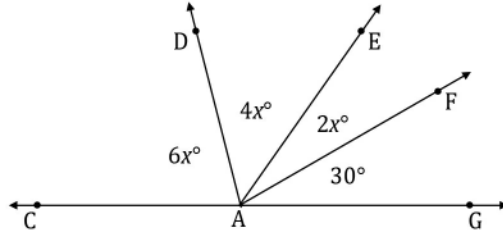
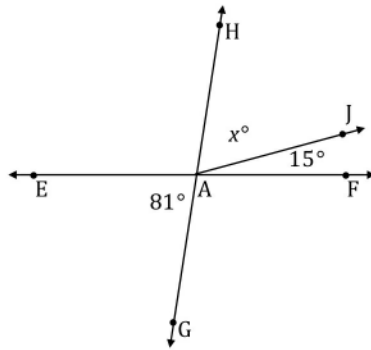

2. Find the measure of a.

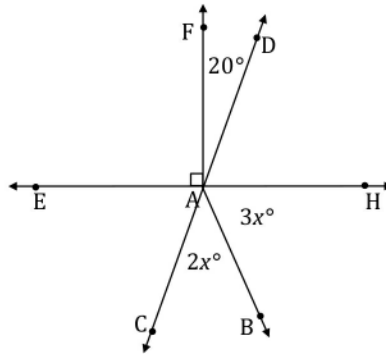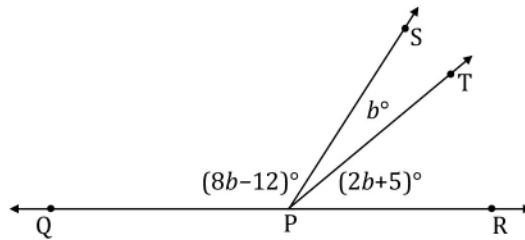3. Find the measures of x and y.

4. Find the measure of $\angle HAJ$.

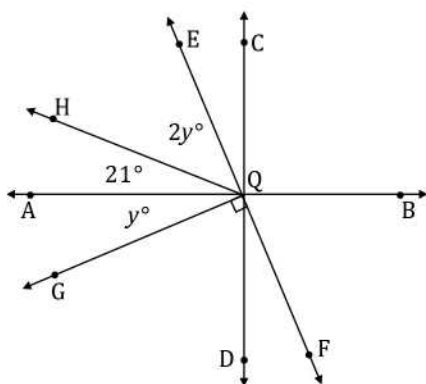

5. Find the measures of $\angle HAB$ and $\angle CAB$.

6. The measure of $\angle SPT = b°$. The measure of $\angle TPR$ is five more than two times $\angle SPT$. The measure of $\angle QPS$ is twelve less than eight times $\angle SPT$. Find the measures of $\angle SPT$, $\angle TPR$, and $\angle QPS$.
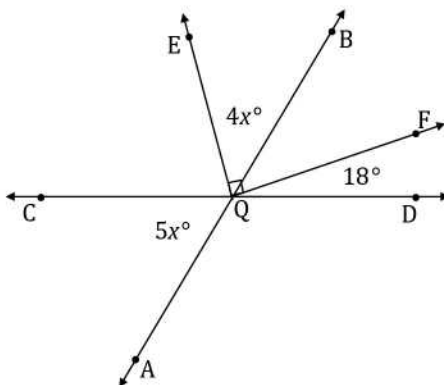
7. Find the measures of $\angle HQE$ and $\angle AQG$.

8. The measures of three angles at a point are in the ratio of $2 : 3 : 5$. Find the measures of the angles.

9. The sum of the measures of two adjacent angles is $72°$. The ratio of the smaller angle to the larger angle is $1 : 3$. Find the measures of each angle.

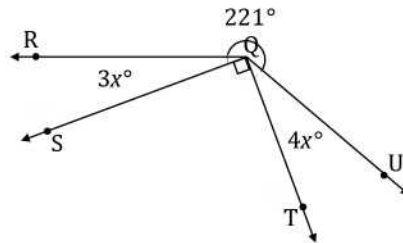10. Find the measures of $\angle CQA$ and $\angle EQB$.

Write an equation for the angle relationship shown in the figure and solve for x. Find the measures of $\angle RQS$ and $\angle TQU$.

$$3x + 90 + 4x + 221 = 360$$
$$7x + 311 = 360$$
$$7x + 311 - 311 = 360 - 311$$
$$7x = 49$$
$$\left(\frac{1}{7}\right)7x = \left(\frac{1}{7}\right)49$$
$$x = 7$$

$m\angle RQS = 3(7°) = 21°$

$m\angle TQU = 4(7°) = 28°$

In a complete sentence, describe the angle relationships in each diagram. Write an equation for the angle relationship(s) shown in the figure, and solve for the indicated unknown angle. You can check your answers by measuring each angle with a protractor.

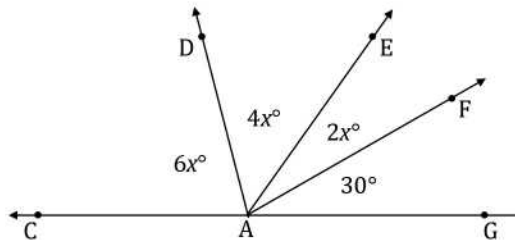1. Find the measures of $\angle EAF$, $\angle DAE$, and $\angle CAD$.

    $\angle GAF$, $\angle EAF$, $\angle DAE$, and $\angle CAD$ are angles on a line and have a sum of $180°$.

    $$6x + 4x + 2x + 30 = 180$$
    $$12x + 30 = 180$$
    $$12x + 30 - 30 = 180 - 30$$
    $$12x = 150$$
    $$x = 12.5$$

    $m\angle EAF = 2(12.5°) = 25°$

    $m\angle DAE = 4(12.5°) = 50°$

    $m\angle CAD = 6(12.5°) = 75°$

2. Find the measure of a.

    Angles $a°$, $26°$, $a°$, and $126°$ are angles at a point and have a sum of $360°$.

    $$a + 126 + a + 26 = 360$$
    $$2a + 152 = 360$$
    $$2a + 152 - 152 = 360 - 152$$
    $$2a = 208$$
    $$\left(\frac{1}{2}\right)2a = \left(\frac{1}{2}\right)208$$
    $$a = 104$$
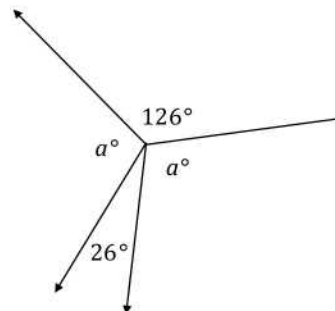
3. **Find the measures of x and y.**

   Angles $y°$ and $65°$ and angles $25°$ and $x°$ have a sum of $90°$.

   $$x + 25 = 90$$
   $$x + 25 - 25 = 90 - 25$$
   $$x = 65$$

   $$65 + y = 90$$
   $$65 + y = 90$$
   $$65 - 65 + y = 90 - 65$$
   $$y = 25$$
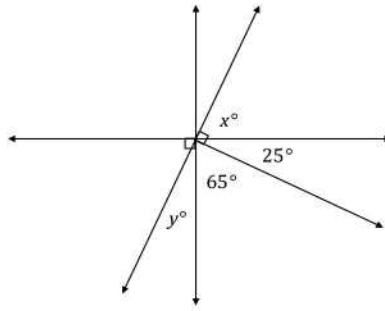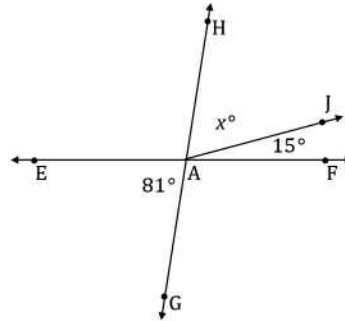
4. **Find the measure of $\angle HAJ$.**

   Adjacent angles $x°$ and $15°$ together are vertically opposite from and are equal to angle $81°$.

   $$x + 15 = 81$$
   $$x + 15 - 15 = 81 - 15$$
   $$x = 66$$

   $m\angle HAJ = 66°$

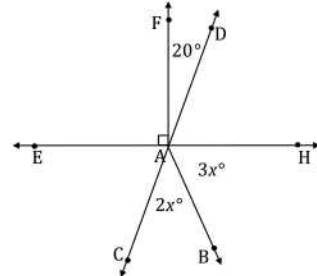5. **Find the measures of $\angle HAB$ and $\angle CAB$.**

   Adjacent angles $\angle CAB$ and $\angle HAB$ have a sum of the measurement of $\angle CAH$, which is vertically opposite from and equal to the measurement of $\angle DAE$.

   $$2x + 3x + 70 = 180$$
   $$5x = 110$$
   $$\left(\frac{1}{5}\right)5x = \left(\frac{1}{5}\right)110$$
   $$x = 22$$

   $m\angle HAB = 3(22°) = 66°$
   $m\angle CAB = 2(22°) = 44°$

6. **The measure of $\angle SPT = b°$. The measure of $\angle TPR$ is five more than two times $\angle SPT$. The measure of $\angle QPS$ is twelve less than eight times $\angle SPT$. Find the measures of $\angle SPT$, $\angle TPR$, and $\angle QPS$.**
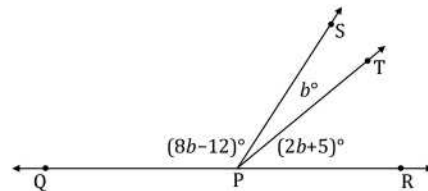
   $\angle QPS$, $\angle SPT$, and $\angle TPR$ are angles on a line and have a sum of $180°$.

   $$(8b - 12) + b + (2b + 5) = 180$$
   $$11b - 7 = 180$$
   $$11b - 7 + 7 = 180 + 7$$
   $$11b = 187$$
   $$\left(\frac{1}{11}\right)11b = \left(\frac{1}{11}\right)187$$
   $$b = 17$$

   $m\angle SPT = (17°) = 17°$
   $m\angle TPR = 2(17°) + 5° = 39°$
   $m\angle QPS = 8(17°) - 12° = 124°$

7. **Find the measures of ∠HQE and ∠AQG.**

   ∠AQG, ∠AQH, and ∠HQE are adjacent angles that have a sum of $90°$.

   $$2y + 21 + y = 90$$
   $$3y + 21 = 90$$
   $$3y + 21 - 21 = 90 - 21$$
   $$3y = 69$$
   $$\left(\frac{1}{3}\right)3y = \left(\frac{1}{3}\right)69$$
   $$y = 23$$

   $m\angle HQE = 2(23°) = 46°$

   $m\angle AQG = (23°) = 23°$
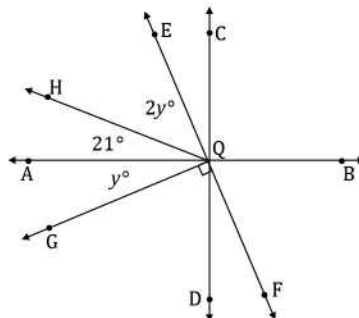
8. **The measures of three angles at a point are in the ratio of $2 : 3 : 5$. Find the measures of the angles.**

   Angle A $= 2x$, Angle B $= 3x$, Angle C $= 5x$

   $$2x + 3x + 5x = 360$$
   $$10x = 360$$
   $$\left(\frac{1}{10}\right)10x = \left(\frac{1}{10}\right)360$$
   $$x = 36$$

   Angle A $= 2(36°) = 72°$

   Angle B $= 3(36°) = 108°$

   Angle C $= 5(36°) = 180°$

9. **The sum of the measures of two adjacent angles is $72°$. The ratio of the smaller angle to the larger angle is $1 : 3$. Find the measures of each angle.**

   Angle A $= x$, Angle B $= 3x$

   $$x + 3x = 72$$
   $$4x = 72$$
   $$\left(\frac{1}{4}\right)(4x) = \left(\frac{1}{4}\right)(72)$$
   $$x = 18$$

   Angle A $= (18) = 18°$

   Angle B $= 3(18) = 54°$

10. **Find the measures of ∠CQA and ∠EQB.**

    $$4x + 5x = 108$$
    $$9x = 108$$
    $$\left(\frac{1}{9}\right)9x = \left(\frac{1}{9}\right)108$$
    $$x = 12$$

    $m\angle CQA = 5(12) = 60°$

    $m\angle EQB = 4(12) = 48°$